

10/711,185

**REMARKS**

Claims 1-25 all the claims pending in the application, stand rejected on prior art grounds. Claims 21-25 stand rejected upon informalities. Applicants respectfully traverse these objections/rejections based on the following discussion.

**I. Amendment of Claim 8 and the Specification**

Claim 8 is amended herein so as to clearly distinguish the present invention from the cited prior art. Support for the features that are amended into claim 8 is found in the drawings. Specifically, the idea that the metal projections of the present invention extend "across said polymer" and "each have a same height" is clearly shown in Figure 3. Thus, these features do not present new matter (see MPEP 2163.06). Additionally, paragraph [0023] of the specification is also amended herein to reflect these features so as to satisfy the written description requirement.

**II. The 35 U.S.C. §112, First Paragraph, Rejection**

Claims 21-25 stand rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement. Specifically, the Office Action indicates that the specification lacks the necessary description of "micelle brushes" for a clear or even reasonable understanding of this aspect of the invention. The test of enablement is whether one skilled in the art could make and use the claimed invention from the disclosure coupled with information known in the art without undue experimentation. United States v. Teletronics, Inc., 857 F.2d 778, 8 USPQ2d 1217 (Fed. Cir. 1988); In re Stephens, 188 USPQ 659 (CCPA 1976). The Applicants respectfully submit that one skilled in the art could make and use the claimed invention from the disclosure coupled with information that is known in the art.

Specifically, it is well-known in the art that polymer brushes refer to assemblies of polymer chains which are chemically secured to a substrate. A micelle is a unit of structure built up from polymeric molecules or ions (as defined by *Merriam-Webster's Medical Dictionary*. ©

10/711,185

2002 Merriam-Webster, Inc.). Thus, a micelle brush is a polymer brush. In the case of the present invention, paragraph [0025] of the specification provides that the polymer 502 "has micelle brushes 504 on the outer surface of the polymer. One end of each micelle brush 504 has an affinity for the polymer 502 and the other end of the brushes 504 has an affinity for the integrated circuit device 110 and the device carrier 112." Additionally, paragraph [0025] further explains that the micelle brushes may comprise a thiol or other reactive moiety at one end which may readily react *with metal surfaces and an organic tail which may react or associate with the polymer matrix* or under fill which act via self assembly on contact with metal and polymer." Thus, the organic tail chemically attaches the micelles to polymer, thereby, forming the micelle brushes. The other end of the micelles are formed with thiol so that they reacts with metal surfaces and, thereby, assist with the attachment and alignment of the polymer bumps to the metal on the device and device carrier or the contacts pads thereon.

In view of the foregoing, the Examiner the use respectfully requested to reconsider and withdraw this rejection.

### III. The Prior Art Rejections

Independent claim 1 as well as claims 3 and 5-7 (which depend from claim 1) stand rejected under 35 U.S.C. §102(e) as being anticipated by Hedler et al (2003/0201452), hereinafter Hedler. Claims 2 and 4 (which also depend from claim 1) stand rejected under 35 U.S.C. §103(a) as being unpatentable over Hedler et al. in view of Perry et al. (6,333,104), hereinafter Perry. Independent claim 8 as well as claims 9-10 and 12-14 (which depend from claim 8) stand rejected under 35 U.S.C. §102(b) as being anticipated by Wark et al. (6,613,662), hereinafter Wark. Claim 11 (which also depends from claim 1) stands rejected under 35 U.S.C. §103(a) as being unpatentable over Wark. Independent claims 15 as well as claims 16-20 (which depend from claim 15) stand rejected under 35 U.S.C. §102(b) as being anticipated by Ball et al. (6,186,392), hereinafter Ball. Independent claim 21 as well as claims 22-25 (which depend from claim 21) similarly stand rejected under 35 U.S.C. §102(b) as being anticipated by Ball. Applicants respectfully traverse these rejections based on the following discussion.

10/711,185

**A. Rejections of Claims 1-7 Based on Hedler.**

The Applicants respectfully traverse the rejections of claims 1-7 based on Hedler because Hedler does not teach the feature of independent claim 1 of a conductive interconnection comprising a "laminated structure" with "alternating metal layers and polymer layers." Nor does Hedler teach that this laminated structure can be substantially cube-shaped or cylinder-shaped.

Hedler teaches a contact connection between a chip and a memory board. However, while the Figures 1a-e of Hedler appear to show that this connection comprises a laminated structure, the description of this contact connection in the specification does not. More particularly, in paragraph [0027] Hedler discloses a conductive adhesive that comprises several components including: (1) polymers as a matrix component; (2) a hardener component; (3) a filler component selected from a group of Ag, Ni, Au, Cu, C, C, Al, Pt, Si and metal-coated particles; and (4) a decomposable component. The adhesive provides a stable contact connection between the chip and memory board but is easily detached. Specifically, the adhesive is detachable because of thermally or UV decomposable components (i.e., sacrificial substances) that are "admixed" into the adhesive (see paragraph [0017]). The decomposable component dissolves the matrix component so that the chip and memory board can be separated. Only the *metal particles* of the filler component (which can be easily removed) remain on the contact surface after the chip and memory board have been separated (see paragraphs [0029-31]). Another chip can then be connected to the memory board. Specifically, "*a drop of the special adhesive with the matrix component K' and a filler component F' is again applied in a metered manner to a second contact surface L2 of the new memory chip C2.*"

According to the *American Heritage® Dictionary of the English Language, Fourth Edition, 2000© by Houghton Mifflin Company*, an adhesive is "a substance, such as paste or cement, that provides or promotes adhesion." The follow details provided in the Hedler specification, and mentioned above, support the conclusion that this "special adhesive" is an adhesive, such or a glue or paste, that is made up of different components rather than a laminated structure: (1) the "special adhesive" is applied as "a drop" in a "metered manner"; (2) the filler component F is selected from the group consisting of different types of "particles"; (3) only "particles" not layers remain on the contact surface after the matrix component dissolves;

10/711,185

and (4) "admixing" vice layering is the term used to describe how the adhesive is made. While the figures 1a-e show the components F and K of this adhesive as being layered, based on Hedler's description of the adhesive itself and how it is formed, it is only reasonable to conclude that this is for the purpose of illustrating the idea that the drop of adhesive has these different components and not for the purpose of disclosing a laminated structure. Additionally, because the adhesive of Hedler is applied by the drop, the interconnection would be neither cube-shaped nor cylinder-shaped, but rather in the shape of a ball with flattened top and bottom surfaces, as illustrated in Figure 1a.

Therefore, independent claim 1 is patentable over Hedler. Furthermore, dependent claims 2 and 4-7 are similarly patentable, not only by virtue of their dependency from a patentable independent claim, but also by virtue of the additional features of the invention they define. Moreover, the Applicants note that claims 1, 2 and 4-7 are properly supported in the specification and accompanying drawings, and no new matter is being added. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejections.

#### **B. Rejections of Claims 8-14 Based on Wark.**

The Applicants respectfully traverse the rejections of claims 8-14 based on Wark because Wark does not teach or suggest the features of independent claim 8 of a conductive interconnection comprising a "polymer" and "metal projections extending towards said polymer from at least one of said integrated circuit device and said device carrier, wherein said metal projections *each have a same height and extend partially into said polymer across the width of said polymer.*"

More particularly, column 2, lines 13-14 of Wark mentions that various materials are used to form bumps on die, such as solder, gold, conductive polymers, etc. However, the invention of Wark addresses solder bumps, not conductive polymer bumps, and specifically addresses the issue of deformation of solder balls when engaged by contact structures (see column 1, lines 19-21). While column 13, lines 44-52, provides that the solder balls are not limited to tin/lead solder and may comprise gold, aluminum or other suitable conductive material. The material is still limited to solder ball material, which does not include thermosetting or thermoplastic polymers.

10/711,185

Additionally, Wark teaches a contact pad with projections configured to penetrate an oxide layer of a solder ball. The projections of various configurations are located only at the outer edges of the bump (see Figures 1A, 2A, 3A, and 4A) or decrease in height from the outer edges towards the center, leaving the center projection free (see Figures 5A, 6A, and 7A). The projections are arranged in this manner to make electrical contact with the solder balls without substantially deforming the solder ball and particularly the center portion of the solder balls (see column 3, lines 62-65). While Wark mentions that different shape and size configurations may be employed, those different configurations may only be employed if the bottom center of the solder ball is not substantially pitted or gouged (see column 7, lines 42-45 and column 13, lines 15-21).

Contrarily, the present invention teaches conductive interconnection comprising a polymer not a solder ball. Polymer bumps do not suffer from the same deformation/reflow issues as solder bumps. Thus, the metal projections of the present invention do not function to prevent shape deformation of the polymer and can, therefore, each have a same height and can extend into the polymer across the width of the polymer. Specifically, the metal projections can extend from either the device or device carrier into both the center of the polymer and the outer edges because gouging and pitting do not present a problem for the flexible polymer material. This combination of polymer and metal projections as configured in the present invention provides a conductive interconnection with enhanced mechanical strength, bonding interfaces and structural integrity.

Therefore, independent claim 8 is patentable over Wark. Furthermore, dependent claims 9-14 are similarly patentable, not only by virtue of their dependency from a patentable independent claim, but also by virtue of the additional features of the invention they define. Moreover, the Applicants note that claims 8-14 are properly supported in the specification and accompanying drawings, and no new matter is being added. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejections.

#### **C. Rejections of Claims 15-25 Based on Ball.**

The Applicants respectfully traverse the rejections of claims 15-25 based on Ball because Ball does not teach or suggest several of the features of independent claims 15 and 21.

Specifically, regarding independent claim 15, Ball does not teach or suggest the feature

10/711,185

that the dendrites comprise "a plated coating on a conductive material." The Office Action cites item 84 of Figure 5J and column 7, line 56, as teaching the dendrites of the present invention as well as teaching that these dendrites comprise a plated coating on a conductive material.

However, Figure 5J does not illustrate a plated coating. Additionally, while column 7, line 56 indicates that the particles 84 may have a dendritic structure, column 7, lines 37-41 define item 84 as "ferromagnetic particles" and provide that suitable particles include "iron, steel, nickel, cobalt, titanium, aluminum, and magnetic stainless steel." Ball does not disclose that dendrites that are a conductive material with a plated coating (see amended claim 1) or, particularly, a conductive material with a plated coating of palladium (see amended claim 2).

Regarding independent claim 21, Ball does not teach or suggest the features of "micelle brushes on the outer surface of said polymer, wherein a first end of said micelle brushes has an affinity for said polymer so as to attach said first end to said polymer and a second end of said micelle brushes has an affinity for metal surfaces so as to attach said second end to said integrated circuit device on one side of said polymer and said device carrier on another side of said polymer." Specifically, as mentioned above, micelle brushes are polymer brushes (i.e., collections of polymer chains chemically attached to a substrate). In case of the present invention, one end of the brushes has an affinity for the polymer (e.g., chemically attaches the micelles to polymer). The other end of the micelles brushes has an affinity for metal surfaces and, thus, attaches to the metal surfaces of or metal contacts on the integrated circuit device on one side of the polymer and the device carrier on the other side of the polymer (e.g., the outer ends of the brushes reacts with metal surfaces to attach and align the polymer to the metal or metal contact pads on the device and device carrier).

The Office Action refers to item 50 of Ball as disclosing the micelle brushes of the present invention. However, item 50 is referred to throughout the specification as a bonding surface and, specifically, described at column 5, lines 5-10 as "aluminum and copper pads, and non-oxidizing solder wettable outer layer, such as gold, platinum or palladium". Thus, item 50 of discloses the pads 506 of the present invention but not the micelle brushes 504 which, as

10/711,185

illustrated in Figure 5, are present all about the outer surface of the polymer 502 and which provide the connection between the polymer 502 and the pad 506.

Therefore, independent claims 15 and 21 are patentable over Ball. Furthermore, dependent claims 16-20 and 22-25 are similarly patentable, not only by virtue of their dependency from a patentable independent claim, but also by virtue of the additional features of the invention they define. Moreover, the Applicants note that claims 15-25 are properly supported in the specification and accompanying drawings, and no new matter is being added. In view of the foregoing, the Examiner is respectfully requested to reconsider and withdraw the rejections.

10/711,185

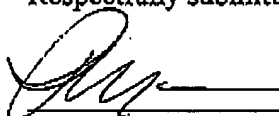
**III. Formal Matters and Conclusion**

In view of the foregoing, Applicants submit that claims 1-25, all the claims presently pending in the application, are patentably distinct from the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary.

Please charge any deficiencies and credit any overpayments to Attorneys Deposit Account Number 09-0458.

Respectfully submitted,

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